REMARKS

Claims 2-5 were examined in the Office Action mailed April 30, 2008. The Applicants wish to thank the Examiner for the useful discussions in the Interview conducted on August 20, 2008. The foregoing amendments and following remarks are consistent with these discussions.

The following rejections under 35 U.S.C. § 103(a) are pending:

- Rejection of claims 2-5 as unpatentable over Applicants' Admitted Prior Art ("AAPA") in view of U.S. Patent Publication No. US 2002/20163730 A1 ("Sugiyama"), U.S. Patent No. 6,977,775 to Sasaki, *et al.* ("Sasaki"), U.S. Patent No. 6,804,269 to Lizotte, *et al.* ("Lizotte"), and U.S. Patent Publication No. US 2004/0264353 A1 ("Kitahari").
- Rejection of claim 3 as unpatentable over AAPA, Sugiyaya, Sasaki, Lizotte and Kitahari, in further view of U.S. Patent No. 5,825,043 to Suwa ("Suwa").
- Rejection of claims 2-5 as unpatentable over AAPA in view of U.S. Patent No. 6,650,480 to Tanaka in view of Sasaki, Lizotte and U.S. Patent Kitahari.
- Rejection of claim 3 as unpatentable over AAPA, Tanaka, Sasaki, Lizotte and Kitahari, in further view of Suwa.

The Applicants have amended the pending claims by canceling claims 2-3, without prejudice to the subject matter therein, and by amending claim 4 to replace the term "essentially" with "almost," at term used in the original Specification, for example at paragraphs [0017], [0045] and [0047].

1. **The Claims Are Patentable Over the Cited References.** The Applicants respectfully traverse the rejections based on the above identified references on the ground that these references do not teach or suggest all of the features of claim 4 for which they were cited.

As a first matter, it is asserted in the Office Action that Specification ¶¶ [0002]-[0009] admit that there are "well known beam splits and well known multiple optical systems associated with one machining lens so that machining speed is improved." April 30, 2008 Office Action at 2. To the extent this assertion implies that there are well-known beam splitters with *one* machining lens, the Applicants submit no such admission has been made.

Specification ¶ [0002] states that it is known to split a laser beam, and to condense the beam splits by two-dimensional optical systems. However, the Applicants did not admit (or even suggest) any association of such beam splitting with *one* machining lens, as implied in the Office Action. Instead, the Applicants expressly noted that one of the *problems* with the systems identified in ¶ [0002] was *the need for multiple machining lens, one for each beam split.* Specification ¶ [0004] ("requires expensive machining lenses as many as the beam splits").

Separately, while the Specification notes that while multiple *separate* "scanning optical systems" can share one machining lens, it is also noted that unsatisfactory results with such arrangements result, due to the problem of having to position the separate optical systems in sub-optimal positions (*i.e.*, beams offset at angles in order to give both systems access to the lens). Specification ¶¶ [0005]-[0008]. In contrast to these arrangements and their problems, there is no admission on the Applicants' part relevant to the Applicants' novel use of *total reflection/transmission type beam combining means* of a specific configuration (set forth in the two final "wherein" clauses of claim 4)

which enables the unique ability of the present invention to split a beam and recombine the *same* beam through *one* machining lens.

Thus, the Applicants respectfully submit that this foundation for the pending rejections is not supported by the Specification.

Before addressing the cited references, the Applicants wish to highlight the tremendous difference between the previous well-known beam splitters and the recited total reflection/transmission type devices.

In the examples in the Specification, Japanese Laid-Open Patent Nos. JP-A-11-58055 (beam splitter 2) and JP-A-11-314188 (mirror 11) are both half mirrors – *i.e.*, mirrors that are well-known to decrease the intensity of the incident beam by fully one-half. The JP-A-11-314188 document also shows dichroic mirrors 12 and 47 splitting reflected beams and guiding them to CCD cameras 25 or 55 for monitoring, the beams reflecting off the dichroic mirrors having different wavelengths. The other example discussed in the Specification, Japanese Laid-Open Patent No. JP 2000-190087, discloses a polarizing beam splitter 12 and a polarizing beam mixer 18, which require the incident beams to be polarized in different directions.

Contrary to these well-known beam splitters and combiners, the claimed total reflection/transmission type beam splitter and beam combiner does not decrease beam intensity, does not require different wavelengths, and does not require different incident polarizations. Instead, due to the unique nature of a total reflection/transmission type devices (including its precise gap alignment, materials and arrangements), as shown in present Fig. 2 small differences in

incident light angle result in light being redirected at almost right angles (light L1 traveling in direction L11) or being transmitted almost straight through the splitter (light beam L2 traveling in direction L21) – with essentially no loss in beam intensity. It is this small difference in incident light angle which conversely requires light entering a total reflection/transmission type of beam *combiner* to be in the "almost" in the same direction or at nearly right angles, so that the re-joined beams leave the combiner in the same direction.

The Cited References: The Applicants submit that the mere accumulation of the "parts" recited in the pending rejections is not enough to teach or suggest the invention recited in claim 4, *i.e.*, merely being aware of the use of splitting and recombining beams (Sugiyama), multiple beam splitting (Sasaki), spacing of prism pairs (Lizotte) and use of a half-mirror in a beam splitter prism (Kitahara), is insufficient. The following demonstrates that the combination of these reference would not have lead to the present invention.

Sugiyama's approach to "beam splitting" requires the use of multiple "fly-eye" lenses to create separate light paths – none of which are collimated beams which might later be recombined – to change a narrow circular laser beam to a uniformly-distributed, narrow linear light image at a target surface.
In Sugiyama, a single laser beam 1 passes through an afocal beam expander 2 which "expands the ray bundle diameter of the beam" (*i.e.*, the ray lines on Sugiyama Fig. 1A are not three separate beams, but only lines representing the center and outer sides of expanded single beam). Sugiyama ¶ [0054]. The expanded beam then passes through two sets of multiple-lens "fly-eye" lens

arrays LA1, LA2 (parts of lens array 4), which create multiple non-collimated light paths that are subsequently refocused on a target by condenser lens 5. *Id.* ¶¶ [0058], [0060]. This is consistent with the objective of Sugiyama, which is to change the round collimated laser beam emerging from laser 1 to an expanded linear light image on the target. *Id.* at ¶ [0061] ("The optical system of the lens array 4 and the condenser lens 5 is an image formation system which also converts the linear image having nonuniform illumination, formed on the intermediate image-forming face 11 by the cylindrical lens 3, *to a linear image having uniform illumination* on the illuminated face 12, which is the final image face." (emphasis added)). The Tanaka reference similarly creates a linear light image from an incident laser beam, relying on a stepped quartz block and plurality of cylindrical lenses (*e.g.*, quartz block 109, cylindrical lens arrays 102, 103) to create a plurality of non-collimated light paths which are subsequently refocused by lenses in a linear pattern on a target surface. Tanaka at 12:49-13:20. Thus, both of these references teach only approaches to changing the *shape* of a laser beam.

Sasaki discloses means for laser crystallization of semiconductor materials in which conventional half-mirrors 51, 52 and 54 split beams. Sasaki at 7:47-85; Fig. 8. As noted above, use of such the conventional half-mirrors results in approximately one-half decrease in incident beam intensity, and there is no alteration of beam polarization. Sasaki further does not suggest any means for re-combining its diminished split beams, as each sub-beam is then directed to its own target area on the target semiconductor surface. *Id.* at 8:2-6; Fig. 8.

Lizotte does not disclose the claimed fixed separation between the faces of a first and second triangular prism pair, but only the ability to change the distance between the prisms, so that the outer sides of the beams passing through the prisms can be spread farther apart. Lizotte at 19:7-30; Fig. 27 ("At least the second pair and preferably both the first and second pair of prism wedges 130, 130' and 132, 132' is supported by an adjustable assembly ... so that at least one pair of the prism wedges ... can be: 1) conveyed to and fro along the optical axis A ... and/or 2) moved closer to or farther away from the other cooperating prism wedges ... *to adjust the amount or degree of separation of the outer laser beams 28 and 32 relative to the central beam 30 – to change the spacing from distance P_1 to distance P_2.*" (emphasis added)).

Kitahara is cited as describing a "half mirror formed within a beam splitter prism." In fact this reference teaches a CD writing laser apparatus in which lasers with two different wavelengths 3, 4 (so-called "red" and "blue" lasers) are only operated when the other is not operating (corresponding to writing CDs having different properties, *e.g.*, red laser writing CD media, blue laser writing DVD media). As shown in Fig. 2 of this reference, the prism 5 (whose faces are in contact, in a conventional manner) is not performing any beam splitting or combining. Rather, either the laser beam from laser 3 passes through prism 5 to half-mirror 6, or the laser beam from laser 4 is turned by prism 5 toward half-mirror 6. *Id.* In any event, it is clear that prism 5 is not acting as a half-mirror (unlike half-mirror 6, prism 5 does not split the incident light beam into two separate half-intensity light beams which travel off in

different directions). As to half-mirror 6, Kitahara teaches nothing more than a convention ½-intensity-decreasing half-mirror, and therefore teaches nothing toward the novel arrangements recited in claim 4.

The Asserted Combination Would Not Teach The Present Invention. Based on the teachings of the cited references, the present invention would not result from their combination.

Modifying Sugiyama's or Tanaka's lens array approach to creating a linear light pattern to incorporate Sasaki's use of half-mirrors to generate multiple beams would, at best, result in multiple linear light images which are either re-distributed into a narrow linear light image, or which must be processed through a plurality of lends (much like the problem in the prior art discussed in the present Specification, where a machining lens is required for each of the multiple beams formed).

Introduction of Lizotte's movable prism pairs would only provide the ability "to adjust the amount or degree of separation of the outer laser beams ... relative to the central beam ... [thus controlling] the desired degree of divergence of the two outer beams relative to the central beam." Lizotte at 19:18-33. In other words, adding Lizotte to Sugiyama/Tanaka and Sasaki would only result in the ability to control how the combination's plurality of beams diverge from one another.

Adding Kitahara's prism 5 or half-mirror 6 to the mix of Sugiyama/ Tanaka, Sasaki and/or Lizotte would add nothing toward the present invention. Kitahara teaches only the use of a prism to allow two separate lasers to send

their respective light beams along the same path (from prism 5 to half-mirror 6) and use of a conventional half-mirror (with its inherent beam intensity drops), so inclusion the Kitahara prism would either only redirect some or all of the plurality of light beams away from the target surface, or alternatively, a plurality of such prisms would accomplish little more than turning the linear light image toward a new target path.

In sum, even if the cited reference were combined, the resulting apparatus would not come close to the present invention – there would be no device which:

(i) uses a total reflection/transmission type beam combining means,

(ii) has a total reflection/transmission type beam combining means having a first triangular prism with a first inclined plane and a second triangular prism with a second inclined plane which facing each other at a fixed distance, such that the optical paths of a first laser beam split and a second laser beam split incoming from two directions essentially perpendicular to each other are aligned in essentially the same direction,

(iii) features a total reflection/transmission type beam combining means which is a polarizing type beam combining means

(iv) has a polarizing type beam combining means which aligns the aligned optical paths of first and second laser beam splits having the same polarization state with a third beam split with a different polarization state, the third beam split from the original laser beam being essentially perpendicular to the aligned first and second laser beam splits (none of the cited references even beginning to suggest combination of beams incident from nearly right angles, let alone combination of such beams having different polarities).

Because no combination of the cited references would result in the invention recited in pending claims 4 and 5, and further because there is nothing in any of these references which teaches or suggests their combination (and no articulation of a reason(s) why these references could be expected to be combined, *i.e.*, under *KSR,* a reasoned statement of a suggestion or motivation or

other reason one of ordinary skill would consider combining these references in order to address the problems solved by the Applicants in the present invention), the mere accumulation of these references does not render claims 4-5 unpatentable under § 103(a). Accordingly, reconsideration and withdrawal of the pending § 103(a) rejections is respectfully requested.

CONCLUSION

In view of the foregoing remarks, the Applicant respectfully submits that claims 4-5 are in condition for allowance. Early and favorable consideration, and issuance of a Notice of Allowance for these claims, is respectfully requested.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #029118.53329US).

Respectfully submitted,

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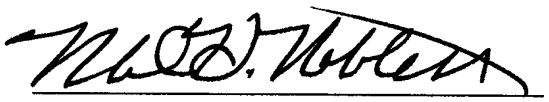

Jeffrey D. Sanok, Reg. No. 32,169
Mark H. Neblett, Reg. No. 42,028

CROWELL & MORING LLP
Intellectual Property Group
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844